ON THE DERIVATION OF ALTERNATIVES

Abstract

Inferences that result from exhaustification of a sentence S depend on the set of alternatives to S. I present some inference patterns that are problematic for previous theories of alternatives and propose some constraints on the derivation of formal alternatives which derive the observations.

1 Introduction

1.1 Exhaustification

The "strengthened" or "exhaustified"meaning of a sentence is the conjunction of its "literal" meaning and its "implicature" (**?**).

(1) John did some of the homework
Implicature: ¬[John did all of the homework]

(2) John introduced three women to seven men
Implicature: ¬[John introduced four women to eight men]

One way to describe the facts, then, is to say that a sentence S, by default, is parsed as **exh**(A)(S), where A is a set of "alternatives" of S and **exh** an exhaustifying operator (cf. **?????**among others).[1]

(3) exh(A)(S) ⇔ S is true and every S′ in A which does not follow from S is false

Under this perspective, predicting the strengthened meaning of S involves predicting what is in A.

(4) a. exh(A)(John did some of the homework)
b. A = {John did Q of the homework | Q ε {some, all}}

(5) a. exh(A)(John introduced three women to seven men)
b. A = {John introduced m women to n men | m, n ε {one, two, three, ... }}

This approach to implicature amounts to assimilating it to association with focus (cf. **???**). The definition of **exh** is essentially that of the focus-sensitive **only**.[2]

(6) only(A)(S) = exh(A)(S)

Unsurprisingly, we seem to be able to do with **only** what we can do with **exh**: (7a) and (7b) express precisely the strengthened meaning of (1) and (2).

(7) a. John only did some$_F$ of the homework

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[1] The definition of **exh** given in (3) is a simplification. A more sophisticated and empirically adequate defintion is the following (cf. **??**).

(i) $\text{exh}(A)(S) = S \wedge \bigwedge\{\neg S' \mid S' \,\varepsilon\, N(S,A)\}$
$N(S,A) := \cap\,\{A' \mid A'$ is a maximal subset of A such that $\{S\} \cup \{\neg S' \mid S' \,\varepsilon\, A'\}$ is consistent$\}$

For our present purposes, however, the simple definition will suffice. The operator **exh** can be seen as a notational device expressing pragmatic reasoning on a sentence (cf. **??**), or alternatively as a grammatical device which is syntactically represented and interpreted by compositional semantics. Arguments that the second option is correct have been made from free choice disjunction (**?**), Hurford's Constraint (**?**), modularity (**??**) and intermediate implicatures (**?**). The precise status of **exh**, however, will not be essential for what follows.

[2] Modulo the fact that **only**(A)(S) presupposes the truth of S rather than assert it. So the correct statement should be: only(A)(S) = exh(A)(S) if $\models_c$ S, undefined otherwise.

b. John only introduced $three_F$ women to $seven_F$ men

For this discussion, we can ignore the differences between **only** and **exh** and regard the former as the overt counterpart of the latter. I will use "EXH" as a cover name for both operators.

Note that exhaustification can lead to contradiction, hence deviance (**?**).

(8) a. John only weighs $seventy_F$ kilograms
'John weighs 70 kg & for all n, n ε $\mathbb{R}$ & n > 70, ¬John weighs n kg'
b. #John only weighs more than $seventy_F$ kilograms
'John weighs more than 70 kg & for all n, n ε $\mathbb{R}$ & n > 70, ¬John weighs more than n kg'[3]

1.2 Aim of the talk

The aim of this talk is to propose a characterization of A which accounts for inference patterns of EXH(A)(S) that pose a challenge for other proposals. An example of such patterns is the paradigm below.

(9) Bill is tall and not bald. John is (only) tall.
Inference: ¬[John is tall and not bald]

(10) Bill passed some but not all of the tests. John (only) passed some of the tests.
*Inference: ¬[John passed some but not all of the tests]

While (9) can be understood to mean that what is true of Bill is not true of John, (10) cannot. Specifically, (9) implies that John is bald, but (10) does not imply that John passed all of the tests.

2 Relevance, symmetry, complexity

2.1 Relevance

? proposes that A = F(S) ∩ C, where F(S) is a grammatically determined set of "formal" alternatives of S and C a pragmatically determined set of "salient" propositions.

(11) Formal alternatives (**?**)
F(S) = {S′ | S′ is derivable from S by replacement of F-marked constituents with expressions of the same semantic type}

Why do we need F(S)?

(12) John only saw $Mary_F$ ≠ John only saw_F Mary

Why do we need C?

(13) a. John only saw_F Mary
*Inference: ¬[John was born in the same century as Mary]

?, henceforth F&K, argue that C should be identified with the set of "relevant" propositions, where relevance is to be closed under negation and conjunction.[4]

(14) Closure conditions on C (**?**)

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[3] If the first conjunct is true, then John weighs more than 70 kg, which means he weighs 70+ε kg, which means he weighs more than 70+ε/2 kg, which means the second conjunct is false. Hence, the conjunction is a contradiction.

[4] These two closure conditions follow from the assumption that to be relevant is to distinguish only between answers to the "question under discussion." More explicitly, let Q be the question under discussion and Ans(Q)(w) be the set of answers to Q that are true in w. For a proposition p to be relevant, it must hold that p makes no distinction between w and w′ if there is no distinction between Ans(Q)(w) and Ans(Q)(w′), i.e. it must hold that p(w) = p(w′) if Ans(Q)(w) = Ans(Q)(w′) (cf. **???**).

(i) If $p \varepsilon C$, then $\neg p \varepsilon C$
(ii) If $p \varepsilon C$ and $q \varepsilon C$, then $p \wedge q \varepsilon C$

2.2 Symmetry

The conception of A as F(S) restricted by relevance leads to a problem with Rooth's definition of F(S): the so-called "symmetry problem."[5]

(15) John (only) has three$_F$ chairs
S = John has three chairs, S′ = John has four chairs, S″ = John has exactly three chairs

Prediction: both S′ and S″ are in F(S), and given that S is relevant, S′ is relevant iff S″ is relevant, hence either both S′ and S″ are in A or none of them is, which means (15) either is contradictory or says nothing about whether John has four chairs.[6] Fact: (15) is not contradictory and says that John does not have four chairs.

Some other examples of the same sort are given below. In each case, the two alternatives S′ and S″ are such that either both are predicted to be in A or none is. And in each case, ¬S′ is the observed inference.

(16) John (only) [did some of the homework]$_F$
S′ = John did all of the homework, S″ = John did some but not all of the homework

(17) John (only) [talked to Mary or Sue]$_F$
S′ = John talked to Mary and Sue, S″ = John talked to Mary or Sue but not both

Such alternatives as S′ and S″ in the examples above are called "symmetric alternatives." More explicitly, we say that S′ and S″ are symmetric alternatives of S if (i) $S' \wedge S''$ is a contradiction and (ii) S′ is relevant iff S″ is relevant.

The "symmetry problem": A is predicted to contain either both S′ and S″ or none of these, while the facts would be derived if A contain S′ but not S″. This problem is solved by "breaking symmetry," i.e. by redefining A in such a way that it can contain S′ to the exclusion of S″.

2.3 Complexity

Building on **??**, F&K advance a theory of alternatives which starts from the intuition that what distinguishes between the symmetric alternatives above is their structural complexity: S″ is more complex than S while S′ is not.

(18) Formal alternatives (F&K)
$F(S) = F_{Rooth}(S) \cap \{S' \mid S' \preceq_c S\}$

The relation '$x \preceq_c y$' holds between linguistic expressions in general and is to be understood as 'x is no more complex than y in discourse context c.'

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5 The symmetry problem was first formulated in the context of the discussion on scalar implicatures (**??**). However, it generalizes to association with focus, as shown in **?**.

6 The more sophisticated definition of **only** proposed by (**??**) and given in footnote 1 would not predict (15) to be a contradition, even if A contains S′ and S″. It would not predict (8b) to be contradictory either. However, that sophisticated definition would rule out both of these sentences when coupled with a constraint which says that EXH has to negate at least some member of A. For simplicity of exposition, we will stick to the simpler definition of **only** given in (3) and continue to describe the deviance of such sentences as (8b) as resulting from logical inconsistency, noting that the term "logical inconsistency" used here requires further delineation so that not every contradiction is linguistically deviant (cf. **??????**).

(19) Complexity metric (F&K)
a. $E' \preceq_c E$ if $E' = T_n(...T_1(E)...)$, where each $T_i(x)$ is the result of replacing a constituent of x with an element of SS(E,c), the substitution source of E in c
b. SS(E,c) = {x | x is a lexical item} ∪ {x | x is a constituent uttered in c}

Basically, E′ is no more complex than E if E′ can be derived from E by a series of substitution transformations, each of which applies to an input x and replaces one constituent of x with a lexical item or a constituent uttered in the context.[7]

F&K account for the cases we have considered.

(20) John (only) has three chairs
F(S) = {**three**, **four**, ~~**exactly three**~~, ... }, because **exactly three** $\not\preceq_c$ **three**

(21) John (only) did some of the homework
F(S) = {**some**, **all**, ~~**some but not all**~~}, because **some but not all** $\not\preceq_c$ **some**

(22) John (only) talked to Mary or Sue
F(S) = {**M or S**, **M and S**, ~~**M or S but not both**~~}, because **M or S but not both** $\not\preceq_c$ **M or S**

And also for cases beyond those we have considered.

(23) Yesterday it was (only) warm. Today it is warm and sunny with gusts of wind.
Inference: ¬Yesterday it was hot
Inference: ¬Yesterday it was warm and sunny with gusts of wind

(24) John is (only) required to read the book or do the homework
Inference: ¬John is required to read the book
Inference: ¬John is required to do the homework

(25) Detective A concluded that the robbers stole the book and not the jewelry. Detective B (only) concluded that they stole the book.
Inference: ¬Detective B concluded that the robbers stole the book and not the jewelry
Inference: ¬Detective B concluded that the robbers stole the book and the jewelry

(26) Derivation of **Detective B concluded that the robbers stole the book and the jewelry**
0. ... [$_{VP}$ stole [$_{A}$ the book]] — the prejacent
1. ... [$_{VP}$ stole [$_{B}$ the book [$_{C}$ and [$_{D}$ not [$_{E}$ the jewelry]]]]] — A/B
2. ... [$_{VP}$ stole [$_{B}$ the book [$_{C}$ and [$_{E}$ the jewelry]]]] — D/E

3 A problem

In the theory of alternatives proposed by F&K, symmetry is broken exclusively in F(S): the problematic symmetric alternative is excluded from A = F(S) ∩ C by conditions imposed on F(S), not on C.

(27) Standard view on symmetry
Symmetry can only be broken formally

Let us, at this point, introduce the main empirical puzzle that this paper sets out to resolve.

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7 It follows from this definition that $E \preceq_c E$, i.e. that an expression is no more complex than itself.

The symmetry breaking data

(28) a. Bill went for a run and didn't smoke. John (only) went for a run.
F(**run**) = {**run**, **run** $\wedge$ ¬**smoke**, **run** $\wedge$ **smoke**, ...}
Inference: ¬[**run** $\wedge$ ¬**smoke**]

b. Bill works hard and doesn't watch TV. John (only) works hard.
F(**work hard**) = {**work hard**, **work hard** $\wedge$ ¬**watch TV**, **work hard** $\wedge$ **watch TV**, ...}
Inference: ¬[**work hard** $\wedge$ ¬**watch TV**]

c. Bill is tall and not bald. John is (only) tall.
F(**tall**) = {**tall**, **tall** $\wedge$ ¬**bald**, **tall** $\wedge$ **bald**, ...}
Inference: ¬[**tall** $\wedge$ ¬**bald**]

Fact: these sentences licence the inference that what is true of Bill is not true of John. Question: should we abandon the standard view on symmetry and allow symmetry to be broken outside of F(S)?

The symmetry preserving data

(29) a. Bill ate exactly three cookies. John (only) ate three cookies.
F(**three**) = {**three**, **exactly three**, **four**, ...}
*Inference: ¬[**exactly three**]

b. Bill fathered children and no twins. John (only) fathered children.
F(**children**) = {**children**, **children** $\wedge$ **no twins**, **children** $\wedge$ **twins**, ...}
*Inference: ¬[**children** $\wedge$ **no twins**]

c. Bill passed some of the tests and failed some. John (only) passed some of the tests.
F(**pass some**) F(S) = {**pass some**, **pass all**, **pass some** $\wedge$ **fail some**, ...}
*Inference: ¬[**pass some** $\wedge$ **fail some**]

The task, then, is to arrive at a characterization of A which distinguishes between these two sets of data in such a way as to match the attested inference patterns.

4 Solving the problem

4.1 First attempt

One strategy that readily comes to mind is to appeal to the notion of a "pragmatic scale" (cf. **?**).

(30) a. Bill went for a run and didn't smoke. John (only) went for a run.
Inference: ¬[**run** $\wedge$ ¬**smoke**]

b. Bill passed some of the tests and failed some. John (only) passed some of the tests.
*Inference: ¬[**pass some** $\wedge$ **failed some**]

(31) Generalization
If F(S) contains two symmetric alternatives S′ and S″, then EXH(A)(S) implies ¬S″ only if there is a pragmatic scale on which S $\wedge$ ¬S″ is ranked lower than S $\wedge$ ¬S′

(32) a. $[_S$ **run**$] \wedge \neg[_{S''}$ **run** $\wedge \neg$**smoke**$] <_{health} [_S$ **run**$] \wedge \neg[_{S'}$ **run** $\wedge$ **smoke**$]$

b. $[_S$ **pass some**$] \wedge \neg[_{S''}$ **pass some** $\wedge$ **fail some**$] <_{?} [_S$ **pass some**$] \wedge \neg[_{S'}$ **pass all**$]$

An account along this line is also supported by the following contrast.

(33) a. Bill went for a run and didn't smoke. John (only) went for a run.
Inference: ¬[John went for a run and didn't smoke]

b. Bill went for a run but didn't lift weight. John (only) went for a run.
*Inference: ¬[John went for a run and didn't lift weight]

It turns out, however, that the pragmatic scale approach, while it promises to account for the contrast in (33), seems hopeless as an explanation for difference between the two sets of cases presented in the last section.

Context: draft dodging in face of impending senseless war, where 'passing all' $<_{\text{luck}}$ 'passing just some'

(34) Bill has once again been dealt a better hand than John. He passed some of the military fitness tests and failed some, while John (only) passed some of the tests.
*Inference: ¬[John passed some of the military fitness tests and failed some]

Context: gluttony rehab center, where 'four cookies' $<_{\text{non–glutton}}$ 'exactly three'

(35) Bill is making more progress at the gluttony rehab center than John. Today he ate exactly three cookies, while John (only) ate three cookies.
*Inference: ¬[John ate exactly three cookies]

Context: genetic lab, where 'fathering twins' $<_{\text{typical}}$ 'fathering children and no twins'[8]

(36) Bill turned out to be a better specimen than John. He fathered children and no twins, while John (only) fathered children.

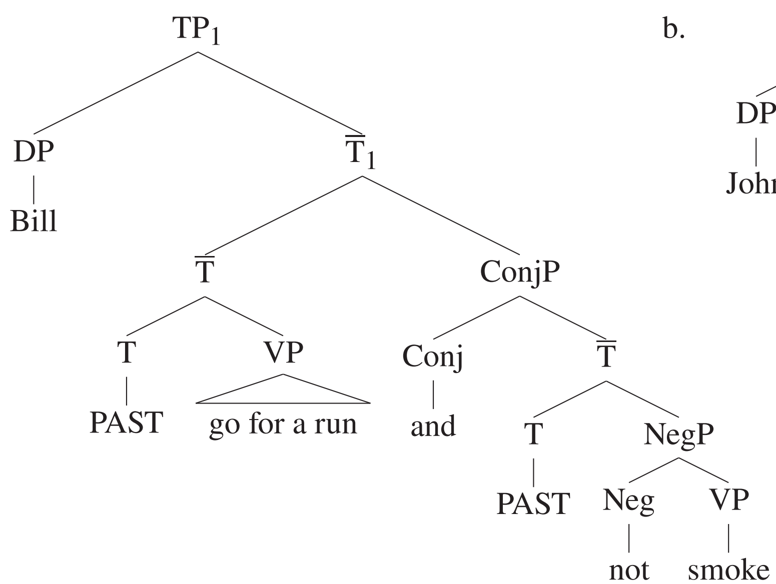
I conclude that a solution to the problem identified in section 3 in terms of pragmatic scales is not tenable.[9]

4.2 Second and final attempt

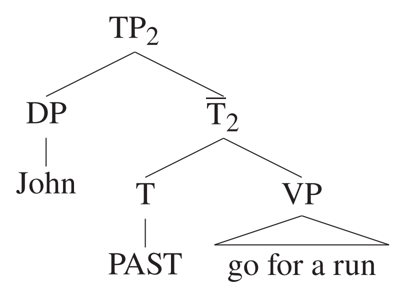
<u>Articulating the problem a bit further</u>

(37) Bill went for a run and didn't smoke. John (only) went for a run.
Inference: ¬[John went for a run and didn't smoke]

(38) a.



b.



Given F&K's definition of F(S), we predict F(TP_2) to be the following set.[10]

(39) F(TP_2) = {**run**, **smoke**, ¬**run**, ¬**smoke**, **run** ∧ ¬**smoke**, **run** ∧ **smoke**}

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[8] Let us, for argument's sake, assume that the male partner <u>can</u> be responsible for monozygotic twinning.

[9] More precisely, the discussion in this section shows that the availability of an evaluative scale is not sufficient for the relevant inference to arise. Still the contrast in (33) suggests that the availability of such a scale is a necessary condition.

[10] Importantly, F&K predict that neither ¬(**run** ∧ **smoke**) nor ¬(**run** ∧ ¬**smoke**) is a formal alternative of TP_2, as none of these can be generated by successively replacing constituents of TP_2 with constituents of either TP_1 or TP_2.

Given that A = F(S) ∩ C and C is closed under negation and conjunction, we expect A to satisfy the following three conditions.

(40) (i) $A \subseteq F(S)$
(ii) S is in A
(iii) There is no S′ in F(S)\A such that S′ is in the Boolean closure of A[11]

Given the attested inference EXH(A)(TP_2), namely that John smoked, we want A in this case to have the following properties.

(41) a. A contains either ¬**smoke** or **run** ∧ ¬**smoke**
b. A contains neither **smoke** nor **run** ∧ **smoke**

Obviously, (41) cannot obtain, given (40) and (39).[12]

The Atomicity Hypothesis

Core of the solution: to revise the definition of F(S) in such a way that F(TP_2) does not contain **run** ∧ **smoke**.

(42) Derivation of **run** ∧ **smoke**

0.	John went for a run	the prejacent
1.	John went for a run and didn't smoke	$\overline{T}_2$ / $\overline{T}_1$
2.	John went for a run and smoked	NegP / VP

(43) First hypothesis (to be discarded)
All elements in F(S) must be derived from S in at most one step

This hypothesis costs us an elegant solution to the problem with multiple disjunction: we want (A and B) to be a formal alternative of (A or (B or C)) (cf. **??**), and there is no way to derive such an alternative it in one step!

(44) a. $[_\alpha$ A or $[_\beta$ B or C$]] \rightarrow [_\alpha$ A or B$] \rightarrow [_\alpha$ A and B$]$
b. $[_\alpha$ A or $[_\beta$ B or C$]] \rightarrow [_\alpha$ A and $[_\beta$ B or C$]] \rightarrow [_\alpha$ A and B$]$

(45) Second hypothesis ("Atomicity")
Expressions in the substitution source are syntactically atomic

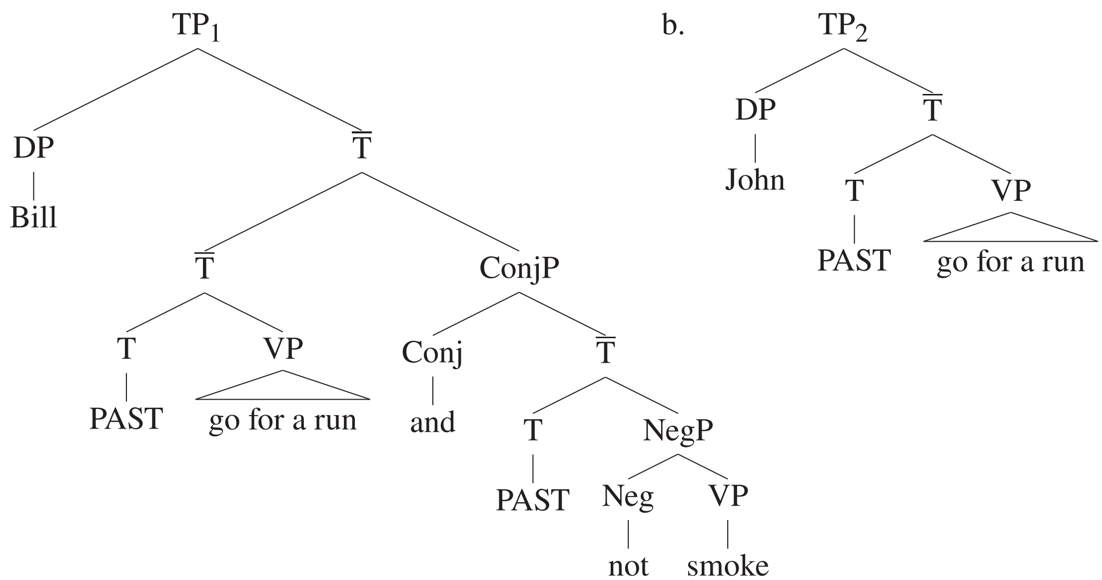
Basically, Atomicity says that expressions in the substitution source cannot have their proper parts replaced by other expressions in the derivation. One way to implement of this idea is to say that every expression in the substitution source is formally marked with a feature, AT, which makes its internal structure invisible and thus inaccessible to syntactic rules.

Intuition: the substitution source is a sort of "numeration," i.e. a collection of "syntactic atoms" to be used in the derivation.

[11] Note that F&K actually end up proposing a revision of the last condition: there is no S′ in F(S)\A such that EXH(A)(S′) is in the Boolean closure of A. The revision is motivated by a problem with disjunction, specifically one of ensuring that if a disjunction is relevant then both disjuncts are (cf. **?** for details). It turns out, however, that this problem can be addressed differently (cf. **?** for a suggestion based on a generalized version of Hurford's Constraint). The distinction between the original and the revised condition on A is immaterial for our discussion.

[12] To see this, suppose (41b) is true and A contains ¬**smoke**. Then F(S)\A contains **smoke**, which is in the Boolean closure of A, since **smoke** ≡ ¬¬**smoke**. Now suppose (41b) is true and A contains **run** ∧ ¬**smoke**, then F(S)\A contains **run** ∧ **smoke**, which is in the Boolean closure of A, since **run** ∧ **smoke** ≡ **run** ∧ ¬[**run** ∧ ¬**smoke**].

(46) a. b.



(47) SS(TP_2,c) = {α = [$_{AT}$ went for a run and didn't smoke], β = [$_{AT}$ smoke], ...}

(48) John went for a run — the prejacent
John [$_{AT}$ went for a run and didn't smoke] — $\overline{T}$ / α
John [$_{AT}$ went for a run and [$_{AT}$ smoked]] — *NegP / β

As we can see, the second step in (48) violates Atomicity: it replaces a proper part of a syntactically atomic expression with another expression. This means that **run** ∧ **smoke** cannot be derived from the prejacent, i.e. that it is not in F(S), which is the result we want.[13]

5 Deriving the facts

5.1 The symmetry breaking cases

Let us first consider the "symmetry breaking" cases, i.e the examples in (28), starting with example we have been discussing.

(49) Bill went for a run and didn't smoke. John (only) went for a run.
Inference: ¬[John went for a run and didn't smoke]

With Atomicity imposed on F&K's concept of formal alternatives, F(**John went for a run**) is now (50).

(50) F(S) = {**run**, **smoke**, ¬**smoke**, **run** ∧ ¬**smoke**}

The set A, which is the domain of EXH, can now be (51), which satisfies all of the conditions in (40).

(51) A = {**run**, **run** ∧ ¬**smoke**}

Consequently, EXH(A)(S) = **run** ∧ ¬(**run** ∧ ¬**smoke**), which is the empirically correct result.

(52) Bill works hard and doesn't watch TV. John (only) works hard.
Inference: ¬[John works hard and doesn't watch TV]

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[13] The reader is invited to verify for herself that Atomicity does not create a problem with multiple disjunctions, i.e. that we can derive (A **and** B), (A **and** C) and (B **and** C) from (A **or** (B **or** C)) without violating Atomicity.

(53) a. F(S) = {**work hard**, **watch TV**, ¬**watch TV**, **work hard** ∧ ¬**watch TV**}
b. A = {**work hard**, **work hard** ∧ ¬**watch TV**}
c. EXH(A)(S) = **work hard** ∧ ¬(**work hard** ∧ ¬**watch TV)**

(54) Bill is tall and not bald. John is (only) tall.
Inference: ¬[John is tall and not bald]

(55) a. F(S) = {**tall**, **bald**, ¬**bald**, **tall** ∧ ¬**bald**}
b. A = {**tall**, **tall** ∧ ¬**bald**}
c. EXH(A)(S) = **tall** ∧ ¬(**tall** ∧ ¬**bald)**

5.2 The symmetry preserving cases

(56) Bill ate exactly three cookies. John (only) ate three cookies.
*Inference: ¬[John ate exactly three cookies]

Atomicity implies that (57) is the set of formal alternatives to S = **John ate three cookies** in this context.

(57) F(S) = {**three**, **exactly three**, **four**, ...}

To get the non-attested inference, we need A, the domain of EXH, to be (58).

(58) {**three**, **exactly three**}

However, (58) violates a condition on A: F(S)\(58) contains **four**, which is in the Boolean closure of (58), because **four** ≡ **three** ∧ ¬**exactly three**.[14]

(59) Bill fathered children and no twins. John (only) fathered children.
*Inference: ¬[John fathered some children and no twins]

(60) a. F(S) = {**children**, **twins**, **children** ∧ **no twins**, **no twins**}
b. *A = {**children**, **children** ∧ **no twins**}
→ F(S)*A contains **twins** ≡ **children** ∧ ¬(**children** ∧ **no twins)**

(61) Bill passed some of the military fitness tests and failed some. John (only) passed some of the tests.
*Inference: ¬[John passed some of the military fitness tests and failed some]

(62) a. F(S) = {**pass some**, **pass all**, **fail some**, **fail all**, **pass some** ∧ **fail some**}
b. *A = {**pass some**, **fail some**, **fail all**, **pass some** ∧ **fail some**}
→ F(S)*A contains **pass all** ≡ **pass some** ∧ ¬**fail some**

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[14] Note that (56) can, with some effort on the part of the hearer, be understood as implying that John ate exactly three cookies, in which case the sequence would sound odd by virtue of not being able to establish a difference between Bill and John. One interpretation of this fact is that the effort in question is one of ignoring the contextually salient alternative **exactly three**, keeping only the lexical alternative **four** in F(S). It seems that in general, such an effort can be made, i.e. that inferences based on contextually salient alternatives are optional (see note 16 and 23 in **?**). Another example illustrating the same point, brought to my attention by Jacoppo Romoli (p.c.), is (i).

(i) Last year, some of my students passed the test. This year, in the same way, not all of them passed it.

Romoli points out, and I agree, that (i) can have the implicature that some of my students passed the test this year. Again, this implicature is predicted to arise if F(**not all**) contains **not some**, generated by lexical replacement, but does not contain the contextually salient alternative **some**. (Adding **in the same way** makes the sequence better, apparently because it then becomes clear that the two sentences are not meant to express a contrast between last year and this year.)

In this discussion, I abstract from the issue of optionality of contextually salient alternatives and discuss the examples under the assumption that the relevant hearer does not make an effort to ignore such alternatives.

5.3 An apparent counter-example

(63) Detective A concluded that the robbers stole the book and not the jewelry. Detective B (only) concluded that they stole the book.
Inference: ¬Detective B concluded that the robbers stole the book and not the jewelry
Inference: ¬Detective B concluded that the robbers stole the book and the jewelry

Cause for worry: **book** ∧ **jewelry** cannot be derived, given Atomicity. However, all we need to get the relevant inference is the alternative in (64), which can be derived.

(64) Detective B concluded that the robbers stole the jewelry

Under the standard assumption that propositional attitude verbs such as **conclude** denote universal quantifiers over worlds and thus distribute over conjunction (cf. **?**), if detective B did not conclude that John stole the jewelry, then he did not conclude that John stole the book and the jewelry.

6 Extending the proposal

6.1 Indirect implicature

Observation: **not[all]** implicates ¬**not[some]** (**???**).[15]

(65) The committee didn't pass all of my students
Inference: ¬[The committee didn't pass some of my students]

Problem for F&K pointed out by **?**: (66) has both (67a) and its symmetric counterpart (67b) as formal alternatives.

(66) $[_{TP}$ PAST $[_{NegP}$ not $[_{VP}$ the committee pass all of my students]]]

(67) a. $[_{TP}$ PAST $[_{NegP}$ not $[_{VP}$ the committee pass some of my students]]
b. $[_{TP}$ PAST $[_{VP}$ the committee pass some of my students]]

The problem is solved by Atomicity: (67b) cannot be derived!

6.2 The switching problem

? discusses another case of overgeneration which has to do with structures in which a weak scalar item embeds a strong one.

(68) Some of my students did all of the readings
*Inference: ¬[all of my students did some of the readings]

Problem: Atomicity does not prevent the derivation of (69) which would give rise to the unattested inference.

(69) all of my students did some of the readings

And it is not the case that **some** and **all** cannot switch places (cf. **??**).

(70) None of my students did all of the reading
Inference: all of my students did some of the reading

Under the standard assumption that **none**, at the relevant level of analysis, is to be decomposed into sentential negation taking scope over **some**, i.e. as **[not[some]]** (cf. **?**and references therein), the observation in (70) can be represented as follows.

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[15] Let "[α[β]]" stand for sentences in which α c-commands β.

(71) [not [some of my students did all of the readings]]
Inference: ¬[not [all of my students did some of the readings]]

What we want, therefore, is the following result.

(72) a. **some[all] $\nrightarrow$ all[some]**
b. **not[some[all]] $\rightarrow$ not[all[some]]**

<u>Proposal</u>

Let F-replacement be the replacement operation that generates alternatives from the prejacent. Suppose F-replacement of a constituent C applies only if the following three conditions are fulfilled.[16]

(73) a. C is not AT-marked
b. C is not asymmetrically c-commanded by an AT-marked constituent
c. The result is not logically weaker than the prejacent

Let us see how these constraints work. First, consider the case where the prejacent **[not[some[all]]]**.

(74)	**[not[some[all]]]**	the prejacent
	[not[some[some$_{AT}$]]]	**all / some$_{AT}$**
	[not[all$_{AT}$[some$_{AT}$]]]	**some / all$_{AT}$**

Note that none of the steps result in a sentence logically weaker than the prejacent. Now consider the case where the prejacent is **[some[all]]**.

(75)	**[some[all]]**	the prejacent
	[some[some$_{AT}$]]	***all / some$_{AT}$**
	[all$_{AT}$[some$_{AT}$]]	**some / all$_{AT}$**
(76)	**[some[all]]**	the prejacent
	[all$_{AT}$[all]]	***some / all$_{AT}$**
	[all$_{AT}$[some$_{AT}$]]	**all / some$_{AT}$**

7 Summary

We have proposed a characterization of formal alternatives which does justice to observations that either have not been made or have posed a challenged for other theories of alternatives, or both. The structural constraints we propose on F(S) show intriguing parallels between the derivation of formal alternatives and the derivation of sentences. Both involves an initial set of expressions to be used, the "substitution source" in the first case and the "numeration" in the second. Expressions in the substitution source are treated as syntactically atomic, making this construct essentially a sort of numeration, albeit one that is contextually determined. The derivation of formal alternatives must proceed from bottom up, with the relevant rule applying to more deeply embedded constituents before applying to less deeply embedded ones. This condition makes the syntactic derivation of formal alternatives strikingly similar to the syntactic derivation of sentences, prompting the question of whether/to what extent the former might be a "cooptation" of the latter. These are questions that we hope will be addressed in future research.

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[16] We can make some sense of these conditions. The first basically says that an expression which replaces another cannot itself be replaced, which makes sense from an economy standpoint, as replacing X with Y and Y with Z is just a cubersome way to replace X with Z. The second condition requires F-replacement to proceed "from bottom up," so to speak: it excludes the possibility of replacing X before replacing Y if X is structurally higher than Y. The last condition says that alternatives which are entailed by the prejacent, i.e. which cannot be negated by EXH, should not be generated. Moreover, it says that F-replacement is "myopic" in the sense that it does not look beyond its output: it compares its output to the prejacent, not what can be derived from its output.